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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/858,337	05/15/2001	William J. Schaff	1153.044US1	1100

7590 11/12/2004  
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EXAMINER

DUONG, KHANH B

ART UNIT PAPER NUMBER

2822

DATE MAILED: 11/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/858,337

Applicant(s)

SCHAFF ET AL.

Examiner

Khanh Duong

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 09 August 2004.  
2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-19 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-19 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.  
5) ☐ Notice of Informal Patent Application (PTO-152)  
6) ☐ Other: \_\_\_\_\_.

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## **DETAILED ACTION**

### ***Response to Arguments***

In view of the Appeal Brief filed on August 9, 2004, PROSECUTION IS HEREBY REOPENED. New ground of rejections regarding claims 10, 11, 16 and 17 in view of Utumi et al. (U.S. Patent No. 5,571,603) are set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

- (1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,
- (2) request reinstatement of the appeal.

If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2).

Currently, claims 1-19 are pending in the application.

### ***Response to Arguments***

Applicant's arguments with respect to the pending claims have been considered but are moot in view of the new ground(s) of rejection.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

- (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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**Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Huang et al. (US 5,719,088).**

Huang et al. ("Huang"), cited in the previous Office Action, discloses a method of forming a channel heterojunction field effect transistor [see FIG. 1-6] comprising the steps of: forming a channel heterojunction field effect transistor having a top surface; and applying an AlN layer 25 to the top surface of the heterojunction field effect transistor 20. Huang et al. states at column 3, lines 55-59 that the AlN layer 25 is being employed as an etch stop layer to ensure that the etching process stops at the AlN layer 25 and reduces the possibility of incidental damage inherently to the layers below. Since the AlN etch stop layer 25 also functions as a protective layer for the layers below during the etching process as previously disclosed, it is appropriate to refer to such layer as a "passivation layer".

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**Claims 2, 5 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang in view of Yoshida (U.S. 6,281,099).**

Huang discloses a method of forming an AlN layer on a channel heterojunction field effect transistor previously as described, which method is repeated herein.

Re claims 2, 5 and 9, Huang fails to show using a molecular beam epitaxy process (MBE) to form the AlN layer to a desired thickness of approximately 500 to 2000 angstroms.

Yoshida, cited in the previous Office Action, suggests forming an AlN layer using MBE wherein beams of Al and RF nitrogen are appeared to be applied simultaneously until a desired thickness between 0.05-1.0 microns (50-10,000 angstroms) is obtained [see col. 2, lines 45-48].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Huang with the teaching of Yoshida by forming an AlN layer using MBE processing, since Yoshida stated at column 1, lines 32-36, that such modification would provide an AlN layer having low resistivity and excellent in electrical conductivity and thermal conductivity.

Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select a thickness for the AlN layer within the range as suggested by Yoshida, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

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**Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang in view of Parmenter et al. (U.S. 5,026,454).**

Re claims 3 and 4, Huang fails to show Al and N being applied alternately until a desired thickness of AlN is obtained.

Parmenter et al. ("Parmenter") teaches in FIG. 1 an MBE apparatus that utilizes shutters 21 and 24 to alternately open and close molecular or atomic beam sources 1 and 2, wherein the beams 1 and 2 are alternately applied for approximately 0.2 seconds or less, or for any length of time required by the deposition process [see col. 2, ln. 52-65].

Since Huang and Parmenter are both from the same field of endeavor, the purpose disclosed by Parmenter would have been recognized in the pertinent prior art of Huang.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Huang with the teaching of Parmenter, since Parmenter states at column 1, line 34 to 35 that such modification would achieve accurate dosage of material at the substrate.

**Claims 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang in view of Yoshida as applied to claims 2, 5 and 9 above, and further in view of Parmenter.**

Re claims 6-8, the combined disclosure of Huang and Yoshida fails to disclose alternately applying Al and RF nitrogen beams at a predetermined amount of time between the alternating beams.

Parmenter et al. ("Parmenter") teaches in FIG. 1 an MBE apparatus that utilizes shutters 21 and 24 to alternately open and close molecular or atomic beam sources 1 and 2, wherein the

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beams 1 and 2 are alternately applied for approximately 0.2 seconds or less, or for any length of time required by the deposition process [see col. 2, ln. 52-65].

Since Huang, Yoshida and Parmenter are from the same field of endeavor, the purpose disclosed by Parmenter would have been recognized in the pertinent prior art of Huang and Yoshida.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combined process of Huang and Yoshida with the teaching of Parmenter, since Parmenter states at column 1, line 34 to 35 that such modification would achieve accurate dosage of material at the substrate.

Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select a process time between alternating beams as taught by Parmenter, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

**Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Huang, Yoshida and Parmenter as applied to claims 6-8 above, and further in view of Utumi (U.S. 5,571,603).**

Re claim 10, the combined disclosure of Huang, Yoshida and Parmenter fails to disclose applying the beams at approximately 150°C.

Utumi, previously cited, suggests the temperature of the substrate, and hence inherently the temperature of the beams, is from 25°C to 1,300°C [see col. 7, ln. 2 to 3]

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Since Huang, Yoshida, Parmenter and Utumi are from the same field of endeavor, the purpose disclosed by Utumi would have been recognized in the pertinent prior art of Huang, Yoshida and Parmenter.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select a temperature for the beams within the range as suggested by Utumi, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

**Claims 11-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Utumi in view of Parmenter and Yoshida.**

Utumi discloses method of forming a layer of AlN of desired thickness [see col. 6, ln. 62 to col. 7, ln. 12] on a semiconductor substrate, the method comprising: using molecular beam epitaxy (MBE): applying beams of Al; and applying beams of remote plasma RF nitrogen with the beams of Al to produce the layer of AlN of desired thickness. Furthermore, Utumi discloses the temperature of the substrate, and hence inherently the temperature of the beams, is from 25°C to 1,300°C [see col. 7, ln. 2 to 3].

Re claim 11-19, Utumi fails to disclose alternately applying the beams of remote plasma RF nitrogen and the beams of Al at specific process parameters such as time, thickness and temperature as claimed.

Parmenter et al. ("Parmenter") teaches in FIG. 1 an MBE apparatus that utilizes shutters 21 and 24 to alternately open and close molecular or atomic beam sources 1 and 2,



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wherein the beams 1 and 2 are alternately applied for approximately 0.2 seconds or less, or for any length of time required by the deposition process [see col. 2, ln. 52-65].

However, Parmenter fails to mention any specific desired thickness of the AlN layer.

Yoshida, as previously discussed above, suggests forming an AlN layer using MBE until a desired thickness between 0.05-1.0 microns (50-10,000 angstroms) is obtained [see col. 2, lines 45-48].

Since Utumi, Parmenter and Yoshida are all from the same field of endeavor, the purposes disclosed by Parmenter and Yoshida would have been recognized in the pertinent prior art of Utumi.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Utumi with the teaching of Parmenter, since Parmenter states at column 1, line 34 to 35 that such modification would achieve accurate dosage of material at the substrate.

It further would have been obvious to one of ordinary skill in the art at the time the invention was made to select specific process parameters such as time, thickness and temperature within the ranges as combinatively suggested by Utumi, Parmenter and Yoshida, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

***Response to Arguments***

Applicant's arguments filed August 9, 2004 have been fully considered but they are not persuasive.

Applicant argues the AlN passivation layer disclosed in claim 1 performs a different function than that of the AlN layer 25 of the Huang reference. In response, the Examiner respectfully disagrees because both the layer 25 of Huang and that of the instant invention are indeed the same material (AlN). Thus, the two layers should perform the same function. Furthermore, the functional recitation "passivation" has not given patentable weight because it is narrative in form. In order to be given patentable weight, a functional recitation must be expressed as a "means" for performing the specified function, as set forth 35 U.S.C. 112, 6<sup>th</sup> paragraph, and must be supported by recitation in the claim of sufficient structure to warrant the presence of the functional language. In re Fuller, 1929 C.D. 172; 388 O.G. 279.

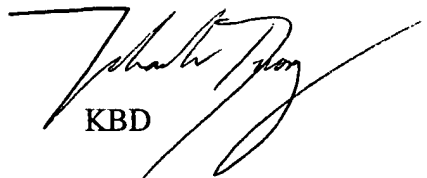
Applicant argues that the passivation layer described in the specification is formed directly on top of the HFET, and not on additional layers. The examiner respectfully disagrees because there is nothing in the claims that recites forming the passivation layer directly on top of the HFET. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khanh Duong whose telephone number is (571) 272-1836. The examiner can normally be reached on Monday - Thursday (9:00 AM - 6:00 PM).


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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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